① To calculate the probability of this occurring, I will need to meet both the Independence Assumption and Sample Size (Normal Distribution) Assumption. In order to meet the Independence Assumption, I will satisfy the

Randomization Condition: The 732 newborns appear to be selected randomly.

10% Condition The 732 newborns is less than 10% of the newborns in the population.

In order to meet the Sample Size (Normal Distribution) Assumption, I will satisfy the

Success/Failure Condition

$n\hat{p} \geq 10$ and $n\hat{q} \geq 10$

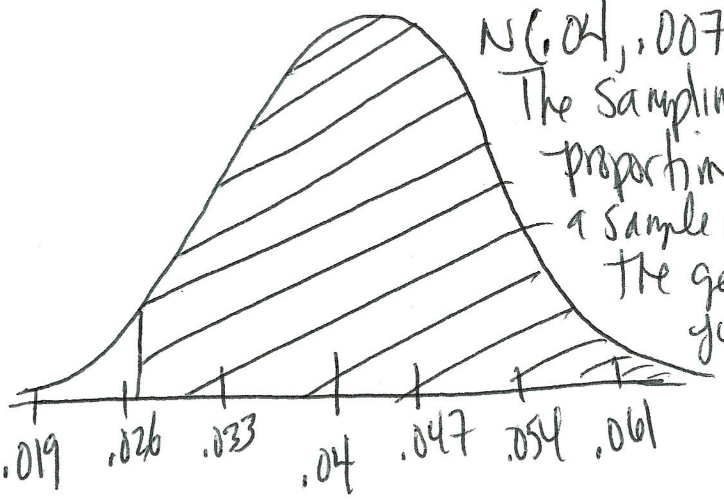
$732(.04) \geq 10$ $\quad$ $732(.96) \geq 10$

$29 \geq 10$ $\quad$ $703 \geq 10$

Both the # of successes and failures are at least 10

Since we have satisfied the Assumptions/Conditions, we can use the Normal Model for the sampling distribution for the proportion of children who have the gene that may be linked to juvinile diabetes in a sample of 732 children. The model for $\hat{p}$ has a mean of .04 and a standard deviation ($SD(\hat{p})$) of .007 $\rightarrow \left[\sqrt{\frac{pq}{n}} = \sqrt{\frac{.04(.96)}{732}} = .007\right]$

(1 cont.) $\hat{p} = .027$, $p = .04$, $SD(\hat{p}) = .007$



$N(.04, .007)$
The sampling distribution of the proportion of children (out of a sample of 732) who have the gene linked to juvenile diabetes.

$$\text{P-value} = p(\hat{p} \geq .027)$$
$$= p(z \geq -1.86)$$
$$= .969$$

$$z = \frac{\hat{p} - p}{SD(\hat{p})} = \frac{.027 - .04}{.007} = -1.86$$

(2) SKIP - DEALS w/ MEANS

(3) a) To calculate a confidence interval, I will need to meet the Independence Assumption + Sample Size (Normal Distribution) Assumption. To meet the Independence Assumption, I will satisfy the

Random Condition: The problem states that the sample was randomly obtained

10% Condition: The 50 students are less than ~~the~~ ~~700~~ 10% of the students in the prof's class (700)

To meet the Sample Size (Normal Distribution) Assumption, I will need to check the

Success/Failure Condition $n\hat{p} \geq 10$ and $n\hat{q} \geq 10$
$35 \geq 10$ $15 \geq 10$ Both successes + failures are at least 10.

Since we have satisfied the Assumptions/Conditions, we can now use the Normal model to create a one-proportion z-interval for the proportion

of all students who are registered to vote.

$n = 50 \quad \hat{p} = 33/50 = .70 \quad SE(\hat{p}) = \sqrt{\frac{\hat{p}\hat{q}}{n}} = \sqrt{\frac{.7(.3)}{30}} = .065$

Our 95% confidence interval is $= \hat{p} \pm z^* SE(\hat{p})$

$= .70 \pm 1.96(.065)$

$= .70 \pm .127$

$= (.573, .827)$

We are 95% confident that ~~the~~ true proportion of the professors' students who are registered voters is between .573 and .827. ← interpretation

b) If many random samples were taken, 95% of the 95% confidence intervals produced would contain the true proportion of the professor's students who are registered to vote.

c) There is no probability involved — once the interval is constructed, the true proportion of the professor's students who are registered to vote is in the interval or it is not. The 95% is just a statement about our confidence.

d) Yes it is reasonable, because 73% lies w/in our 95% confidence interval. Remember, we stated in "a" that we were 95% confident that the true proportion was between 57.3% and 82.7%

e) $ME = z^* \sqrt{\frac{pq}{n}}$

$.04 = 1.96 \sqrt{\frac{.73(.27)}{n}}$

$n \approx 474$

She would need to sample 474 students to create a 95% confidence interval w/a margin of error of ±4%

95% CI = (.69 — .77) ← same confidence, but more accurate

(4) I would increase the sample size. Thus, keeping my certainity the same (95%), but increasing my precision.

(5) I would increase the sample size (decrease margin of error) and change my confidence level to 99% by changing the critical value (from $z^* = 1.96$ to $z^* = 2.58$. By doing this I increase my certainity (or confidence) of capturing the true proportion, while also increasing my precision in the range within the proportion would be (margin of error)

(6) a) It would still be skewed left. The sample size is not large enough. In order for the Central Limit Theorem to apply (and create a symmetric sampling distribution) we need to have a large enough sample size if the population distribution was skewed (size is not important is population is already symmetric).

b) We would need to increase the sample size.

DO NOT DO #7
(IT DEALS WITH MEANS)